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PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

MICHAEL REDECKER

Serial No.: 10/727,642 Examiner: *to be assigned*

Filed: 5 December 2003 Art Unit: 1711

For: MOLECULAR CHEMICAL COMPOUNDS WITH STRUCTURES ALLOWING ELECTRON DISPLACEMENT AND CAPABLE OF EMITTING PHOTOLUMINESCENT RADIATION, AND PHOTOLUMINESCENCE QUENCHING DEVICE EMPLOYING THE SAME

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with 37 C.F.R. §1.56, and §§1.97 and 1.98 as amended, Applicant cites, describes, and provides copies of the following art references:

U.S. PATENT REFERENCE:

- U.S. Patent No. 5,814,244 to Kreuder, entitled POLYMERS COMPRISING TRIAYLAMINE UNITS AS ELECTROLUMINESCENCE MATERIALS, issued on 29 September 1998;

- U.S. Patent No. 5,093,210 to Ohta et al., entitled ELECTROLUMINESCENT DEVICE, issued on 3 March 1992;

- U.S. Patent No. 6,180,217 to Ueda et al., entitled ORGANIC ELECTROLUMINESCENT ELEMENT, issued on 30 January 2001.

FOREIGN PATENT REFERENCE:

- European Patent Application No. EP 0 866 110 A1 to Onikubo et al., entitled LIGHT-EMITTING MATERIAL FOR ORGANO-ELECTROLUMINESCENCE DEVICE AND ORGANIC ELECTROLUMINESCENCE DEVICE, published on 23 September 1998;

- International Patent Application No. WO 97/40648 to Schoo et al., entitled ORGANIC ELECTROLUMINESCENT DEVICE, published on 30 October 1997;

- International Patent Application No. WO 02/092723 A1 to Towns et al., entitled SUBSTITUTED FLUORENE POLYMERS, THEIR PREPARATION AND USE IN OPTICAL DEVICES;

- European Patent Application No. EP 0 891 121 A1 to Inoue et al., entitled ORGANIC ELECTROLUMINESCENT ELEMENTS, published on 13 January 1999;

- European Patent Application No. EP 1 061 112 A1 to Hosokawa et al., entitled ORGANIC ELECTROLUMINESCENT ELEMENT, published on 28 December 1999;

- European Patent Application No. EP 1 195 422 A1 to Sugiura et al., entitled THIN

FILM EL DEVICE, published on 10 April 2002;

OTHER REFERENCES:

- *SYNTHESIS AND DEVICE CHARACTERISATION OF SIDE-CHAIN POLYMER ELECTRON TRANSPORT MATERIALS FOR ORGANIC SEMICONDUCTOR APPLICATIONS*, by Dailey et al., JOURNAL OF MATERIALS CHEMISTRY; XP-002271343; published on web 2 August 2001;

- *A NOVEL EMITTING POLYMER WITH BIPOLAR CARRIER TRANSPORTING ABILITIES*, by Wang et al., JOURNAL OF APPLIED POLYMER SCIENCE; XP-002271344; accpeted 30 July 2002;

- *ELECTROLUMINESCENCE OF 1,3,4-OXADIAZOLE AND TRIPHENYLAMINE-CONTAINING MOLECULES AS AN EMITTER IN ORGANIC MULTILAYER LIGHT EMITTING DIODES*, by Tamoto et al., CHEMICAL MATERIAS; 1997; XP-002271345;

- *IMPROVED EFFICIENCIES OF LIGHT-EMITTING DIODES THROUGH INCORPORATION OF CHARGE TRANSPORTING COMPONENTS IN TRI-BLOCK POLYMERS*, by Chen et al., SYNTHETIC METALS; 1999; XP-002271346;

DISCUSSION

EP 0 866 110 to Onikubo et al., which was cited in the European Search report (to corresponding EP 1 443 093 A1), relates to a light-emitting material which serves to emit light

having a high brightness and is almost free of deterioration in light emission, and an organic EL device for which the light-emitting material is adapted.

In *SYNTHESIS AND DEVICE CHARACTERISATION OF SIDE-CHAIN POLYMER ELECTRON TRANSPORT MATERIALS FOR ORGANIC SEMICONDUCTOR APPLICATIONS,* improved syntheses and polymerisations are reported of monomers bearing electron transporting subsituents based on 2,5-diphenyloxadiazole and 2,3-diphenylquinoxaline attached directly to a vinyl group. By copolymerisation and by use of mixtures of homopolymers, these materials have been incorporated into light emitting polymer devices in which hole conduction properties are provided by 4-vinyltriphenlamine groups. High luminescence efficiency is achieved by use of a fluroescnet additive. The resulting devices show narrow emission bands and high brightnesses, except in the case of those based on a diphenyloxadiazole-triphenlamine polymer blend. Thermal analysis data are equivocal but the presented evidence that in this system, but not the quinoxaline blend, phase separation occurs. The minority charge carrying capacity of the homopolymers is probed; it is shown that the quinoxaline derivative has hole blocking properties superior to those of the oxadiazole polymer and is a good candidate for use in optimised devices.

The article *A Novel Emitting Polymer with Bipolar Carrier Transporting Abilities* relates to a luminescent bipolar polymer containing 1,3,4-oxadiazole and triphenylamine has been synthesized. A smooth and dense thin film polymer is easily obtained by spin coating its chloroform solution. This film exhibits a strong blue fluorescence under the irritation of ultraviolet (UV) light. The synthesized polymer possesses a high glass transition temperature (T_g) of 167°C. A single-layer electroluminescence (EL) device indium-tin oxide (ITO)/polymer/Mg:Ag emitted blue light with a turn-on voltage of 13 V.

In *ELECTROLUMINESCENCE OF 1,3,4-OXADIAZOLE AND TRIPHENYLAMINE-*

CONTAINING MOLECULES AS AN EMITTER IN ORGANIC MULTILAYER LIGHT EMITTING DIODES, five new emitter molecules having an oxadiazole group as an electron transport unit and a triphenylamine group as a hole transport unit are synthesized. It also discloses study of the optimum EL cell structures using the bipolar emitters, as well as measuring durabilities of the EL devices at constant current density.

WO 97/40648 to Schoo et al., relates to an organic electroluminescent device whose electroluminescence efficiency is independent of the work function of the cathode material, and whose service life under ambient conditions is excellent without the necessity of taking additional protective measures. These properties are obtained as a result of the fact that an organic layer of the device comprises mobile ions which are compensated by immobile ions in such a manner that the polarity of all mobile ions is the same.

Kreuder et al.'244 discloses an electroluminescence material comprising one or more polymers which comprise structural units of a formula where the symbols and indices have the following meanings:

Ar^1, Ar^2, Ar^3, Ar^4, Ar^5, Ar^6 are identical or different, monocyclic and/or polycyclic aryl and/or heteroaryl groups which may be linked via one or more bridges an/or be condensed and may be unsubstituted or substituted, where Ar^1, Ar^3, Ar^5 and Ar^6 are each divalent and Ar^2 and Ar^4 are each monovalent;

R^1 is H, a hydrocarbon radical having from 1 to 22 carbon atoms, which may be unsubstituted or substituted, preferably by F, and can also contain heteroatoms, preferably 0, or Ar^7, where Ar^7 is, independently of Ar^{1-6}, as defined for Ar^{1-6};

n is 0, 1 or 2

The electroluminescence material of the invention has, inter alia, a low threshold voltage of the electroluminescence and a high efficiency, although the polymers are not conjugated.

WO 02/092723 A1 to Towns et al., discusses a polymer for use in an optical device

comprising: a hole transporting region, an electron transporting region, an emissive region, said polymer comprising an optionally substituted repeat unit of formula (I): wherein each Ar is the same or different and comprises an optionally substituted aryl group.

EP 0 891 121 A1 to Inoue et al., which was also cited in the European Search Report, discloses an organic EL device which uses an optical and electronic functional material particularly less susceptible to physical changes, photochemical changes and electrochemical changes, and can give out light emissions or various colors with high reliability and high light emission efficiency; an organic EL device comprising an organic think film formed by an evaporation technique of a compound that has high amorphism and high compatibility with a hole injecting electrode, said organic EL device being substantially free from a driving voltage increase or a luminance drop and a current leakage with neither development nor growth of local non-emitting spots, and so being capable or emitting light with high luminance, and high reliability such as high heat resistance; an organic EL device using a multilayered film, said organic EL device comprising a hole injecting electrode or an organic material combined therewith, to which the optimum work function is imparted, and having high heat resistance; and an organic EL device capable of having high Hole mobility and so obtaining much high current density.

In *IMPROVED EFFICIENCIES OF LIGHT-EMITTING DIODES THROUGH INCORPORATION OF CHARGE TRANSPORTING COMPONENTS IN TRI-BLOCK POLYMERS*, 9,9-Di-*n*-hexylfluorene-*co*-anthracene (DHF-ANT) random copolymer and triphenylamine (TPA) and oxadiazole (OXA)–containing tri-block copolymers along with a crosslinked TPA are used to fabricate single- and double-layer light emitting diodes (LEDs). In both single-layer and double-layer devices, TPA hole transporting components improve hole injection and transport, leading to improved device performance when low work function calcium (Ca) is used as the cathode, whereas OXA electron transporting components improve electron injection when high work function aluminum (Al) is used. This suggests that DHF-ANT copolymer and DHF_ANT blocks in the two tri-block polymers are hole-limited in devices with Ca cathodes, and electron-limited with Al

cathodes. Furthermore, double-layer devices including a separate hole transporting crosslinked TPA layer increase device efficiencies by at least one order in magnitude over the corresponding single-layer devices, due to the improved charge injection, charge confinement and charge recombination.

EP 1 061 112 A1 to Hosokawa et al., provides materials for organic electroluminescence devices and organic electroluminescence devices which exhibit high efficiency of light emission and have a long life and excellent heat resistance, novel compounds and processes for producing the materials for organic electroluminescence devices

Ohta et al.'210 discloses an electroluminescent device having a luminescent layer comprising a luminescent material, which is capable of directly converting the energy of electric field applied thereto into a light energy and capable of providing a large surface-area luminescence.

EP 1 195 422 A1, which was cited in the European Search Report, relates to a think film EL device having high electroluminescent efficiency, a low operating voltage, and a long lifetime. A think film EL device of the present invention uses, as a luminescent layer, a charge-transport luminescent material that has, within a molecule, a portion contributing to charge transport and a portion contributing to luminescence where at least two molecular orbitals contributing to luminescent transition are localized.

Ueda et al.'217 discusses an organic electroluminescent element having excellent durability with increased luminescence intensity, low luminescence starting voltage, and excellent stability with repeated use. An organic electroluminescent element having at least a positive electrode, hole-injection layer, hole-transporting layer, luminescent layer, and negative electrode, wherein the positive electrode has an ionization potential of 5.18-5.35 eV, the hole-injection layer has an ionization potential of 4.80-5.18 eV, and the hole-transporting layer has an ionization potential of 5.20-5.70eV.

The citation of the foregoing references is not intended to constitute an assertion that other or more relevant art does not exist. Accordingly, the Examiner is requested to make a wide-ranging and thorough search of the relevant art.

Pursuant to 37 CFR § 1.97(d), the undersigned attorney hereby certifies that each item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign patent application not more than three(3) months prior to the filing of the statement.

No fee is incurred by this Statement.

Respectfully submitted,

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U.S. PATENT DOCUMENTS

EXAMINER	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	5,814,244		Kreuder			
	5,093,210		Ohta et al.			
	6,180,217		Ueda et al.			

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	EP 0 866 110 A1		EP				
	WO 97/40648		WO				
	WO 02/092723 A1		WO				
	EP 0 891 121 A1		EP				
	EP 1 061 112 A1		EP				
	EP 1 195 422		EP				

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)

	SYNTHESIS AND DEVICE CHARACTERISATION OF SIDE-CHAIN POLYMER ELECTRON TRANSPORT MATERIALS FOR ORGANIC SEMICONDUCTOR APPLICATIONS, by Dailey et al., JOURNAL OF MATERIALS CHEMISTRY; XP-002271343; published on web 2 August 2001.
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EXAMINER:	DATE CONSIDERED:

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP §609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.